

UMJ-116-D (UM 2171p2)

6

REMARKS

The Office Action of March 7, 2005 has been received and carefully reviewed. It is submitted that, by this communication, all bases of rejection are traversed and overcome. Upon entry of this communication, Claims 1-20 remain in the application. Claims 21-24 have been cancelled. Reconsideration of the claims is respectfully requested.

Claims 1-20 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-23 of copending Application No. 10/393,962, of which this application is a continuation-in-part. Claims 1-4, 7-11, and 14-20 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-4 and 7-15 of copending Application No. 10/234,681, of which Application No. 10/393,962 is a continuation-in-part. Claims 1-20 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-42 of copending Application No. 10/726,935, which is a continuation-in-part of the pending application. The Examiner states that although the conflicting claims are not identical, they are not patentably distinct from each other because the conflicting claims disclose a process substantially the same.

The Examiner also states that a timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on the nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application.

A terminal disclaimer in compliance with 37 CFR 1.321(c) is being filed concurrently herewith in order to overcome the provisional rejection of claims 1-20 based on the obviousness-type double patenting over Application No. 10/726,935. Terminal disclaimers are being filed concurrently with the responses to the Official Action in the 10/234,681 case and in the 10/393,962 case in order to overcome the provisional rejection of claims 1-4 and 7-15, and claims 1-20, respectively. Applicants respectfully submit that the terminal disclaimers overcome the provisional rejections based on the judicially created doctrine of obviousness-type double patenting.

Claims 9-14 and 18 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner states that the term "substantially the

UMJ-116-D (UM 2171p2)

7

"entire surface area" is indefinite since it is unclear how much of the surface area covered by the metal is considered to be "substantially" entire.

Applicants do not acquiesce to the Examiner's rejection. However, in order to expedite prosecution, Applicants have amended claim 9 to recite that the d-block transition metal compound is "dispersed on at least some of the surface area." Support for this revision may be found in the specification as filed on page 15, lines 17-19. As such, Applicants respectfully submit that the rejection of claims 9-14 and 18, under 35 U.S.C. 112, second paragraph, has been traversed and overcome.

Claims 1-4, 7, 8, 15, 16, 17, 19, and 20 stand rejected under 35 U.S.C. 103(a) as obvious over Michlmayr (U.S. Patent No. 4,188,285) in view of Milton (U.S. Patent No. 2,882,244).

The Examiner states that Michlmayr discloses a process of removal of thiophenes from gasoline by contacting the feed with an adsorbent which is silver exchanged faujasite zeolite, namely silver-Y zeolite. The Examiner admits that Michlmayr does not disclose how to activate and regenerate the spent adsorbent. The Examiner states that Milton teaches activating and regenerating a molecular sieve adsorbent used for removing thiophene by raising the temperature. As such, the Examiner asserts that it would have been obvious to modify the Michlmayr adsorbent to maintain its life. Further, the Examiner admits that Michlmayr is silent as to the mechanism of how thiophene is bound to the adsorbent. The Examiner asserts, however, that it is expected that the silver-Y zeolite adsorbent of Michlmayr is inherently bound to thiophene by π -complexation. The Examiner goes on to state that it is expected that the Michlmayr adsorbent can inherently adsorb more than 1 mmol/gram of thiophene since the adsorbent of the claimed process and the one of Michlmayr are similar. The Examiner also admits that Michlmayr does not disclose that the silver exchanged Y zeolite is Ag(I)Y. The Examiner asserts that it would be obvious to have modified to the Michlmayr process by using Ag(I)Y since it is expected that using any silver exchanged zeolite would yield similar results. The Examiner admits that Michlmayr does not disclose that the gasoline is unleaded. However, the Examiner asserts that it would have been obvious to have modified the Michlmayr process by using unleaded gasoline.

Applicants respectfully disagree with the Examiner's assertion that the Michlmayr adsorbent is inherently bound to thiophene by π -complexation. To facilitate π -complexation, a dehydrated adsorbent, as recited in Applicants' amended claim 1, is used. Support for the revisions to claim 1 may be found in the specification as filed at page 17, lines 19-21 and

UMJ-116-D (UM 2171p2)

8

page 12, lines 6-14. If water molecules remain in the adsorbent, π -complexation will generally not occur, rather the metal/metal ion will bond with the sulfur atom. Michlmayr does not teach or suggest that the adsorbent is dehydrated, as such, it is not inherent that the binding of thiophene to the Michlmayr adsorbent would occur via π -complexation.

Further, Applicants respectfully disagree with the Examiner's assertion that the Michlmayer adsorbent inherently adsorbs more than 1/mmol/gram of thiophene. Michlmayr teaches that the sulfur capacities range from 0.07 wt.% to 0.15 wt.% for Ag-Y, with a maximum of 0.2 wt.% (0.0238 mmol/g) (see Examples 1 and 2). It is submitted that the lower sulfur capacities described in Michlmayr result, at least in part, from water molecules remaining in the zeolite. As previously stated, Michlmayr does not teach or suggest that the adsorbent is dehydrated. As such, it is not inherent that a non-dehydrated adsorbent would adsorb as much thiophene/thiophene compounds (over 40 times more than that taught in Michlmayr) as the dehydrated adsorbent recited in Applicants' claim 1.

Further, claims 8 and 10 have been amended to recite that, "at ambient temperature and 10-5 atm vapor pressure, the dehydrated adsorbent adsorbs more than about 1 mmol/gram of the at least one of thiophene and thiophene compounds." Support for these revisions may be found in the specification as filed at page 4, lines 11-12, page 16, lines 26-27, and in Experiments A through C. Further, Applicants respectfully submit that one skilled in the art would know that vapor pressure would be used (see Beckman's website at: <http://www.beckman.com/products/instrument/partChar/technology/GasAdsorption.asp>, which states in part: "An adsorption isotherm (one temperature) is usually recorded as volume of gas adsorbed (cc/g @ STP) versus relative pressure (i.e., sample pressure / saturation vapor pressure).").

As such, it is submitted that the Michlmayr reference does not teach or suggest a dehydrated adsorbent as recited in Applicants' invention as defined in claim 1.

Assuming *arguendo* that it would be obvious to combine the teachings of Michlmayr and Milton, one would not render Applicants' invention as defined in claim 1, and those claims depending therefrom. Neither Michlmayr nor Milton teaches a dehydrated adsorbent that preferentially adsorbs thiophene and/or thiophene compounds via π -complexation. As such, it would not be obvious that the activation and regeneration processes for an adsorbent that does not π -complex (described in Milton) would be useful for an adsorbent (such as that recited in Applicants' claim 1, from which claims 2-4, 7, 8, 15, 16, 17, 19, and 20 ultimately depend) that is capable of π -complexation.

UMJ-116-D (UM 2171p2)

9

For the all reasons stated above, it is submitted that Applicants' invention as defined in claims 1-4, 7, 8, 15-17, 19, and 20 is not anticipated, taught or rendered obvious by Michlmayr and Milton, either alone or in combination, and patentably defines over the art of record.

Claims 9-11 and 14 stand rejected under 35 U.S.C. 103(a) as obvious over Michlmayr in view of Milton, and further in view of Tsybulevskiy et al. (2002/0009404). The Examiner admits that Michlmayr does not disclose a carrier for the adsorbent, nor how to activate and regenerate the spent adsorbent. The Examiner states, however, that Tsybulevskiy discloses an adsorbent also containing a binder, such as silica, and Milton discloses how to activate and regenerate a molecular sieve. The Examiner concludes that it would have been obvious to one skilled in the art to modify the process of Michlmayr by including a binder in the adsorbent to arrive at Applicants' invention, since it is expected that this would increase the strength of the adsorbent. The Examiner further concludes that once the silica was selected, metals are expected to cover the binder.

Applicants respectfully submit that the combination of Michlmayr, Tsybulevskiy and Milton does not render Applicants' invention as defined in any of claims 9-11 and 14. Reiterating the above arguments, neither Michlmayr nor Milton teaches adsorbing thiophene or thiophene compounds via π -complexation.

The process taught in Tsybulevskiy actually teaches away from π -complexation by specifically stating that the selectivity was through physical adsorption--see Page. 3, paragraph [0036]:

These higher molecular weight sulfur compounds are then adsorbed by these synthetic faujasites. The physical adsorption of these sulfur compounds on zeolites is increased, due to their higher molecular weight. Because the adsorption of the sulfur compounds on the synthetic faujasites of the present invention is a two-stage process, i.e., first catalytic conversion of sulfur contaminated compounds, followed by physical adsorption of the catalytically converted products, these synthetic faujasites which are the subject of the present invention are termed "adsorbent-catalyst." (*emphasis added*).

Applicants respectfully submit that the Tsybulevskiy does not teach, suggest or even inherently show the possibility of adsorbing through π -complexation. As such, the Examiner's suggested combination does not render Applicants' invention as defined in claim 1 (from which claims 9-11 and 14 depend), which recites preferential adsorption via π -complexation.

UMJ-116-D (UM 2171p2)

10

For all the reasons stated above, it is submitted that Applicants' invention as defined in claims 9-11 and 14 is not anticipated, taught or rendered obvious by Michlmayr, Milton, and Tsybulevskiy, either alone or in combination, and patentably defines over the art of record.

Claim 18 stands rejected under 35 U.S.C 103(a) as being obvious over Michlmayr in view of Milton, in view of Tsybulevskiy et al., and further in view of Satokawa et al. (2001/0014304). The Examiner admits that Michlmayr does not disclose that the silver is silver nitrate. However, the Examiner states that Satokawa discloses an adsorbent containing silver nitrate that is used for thiophene adsorption. The Examiner concludes that it would have been obvious to combine the teachings to render Applicants' invention as defined in claim 18.

As previously stated, the combination of Michlmayr, Milton, and Tsybulevskiy does not render an adsorbent capable of π -complexation, as recited in Applicants' claim 1. Satokawa teaches an adsorbent for the removal of sulfur (e.g. mercaptans) from natural gas. In the examples of Satokawa, the mercaptans were dimethyl sulfide and t-butyl mercaptan. The gas is a "city gas" including methane, with small amounts of ethane, propane and pentanes (see paragraph [0039] of Satokawa). In sharp contrast, Applicants recite removal of thiophene/thiophene compounds from liquid fuel. Further, the sulfur-containing molecules of Satokawa are **saturated, not aromatic**, sulfides. In sharp contrast, thiophene/thiophene compounds in liquid fuel are **aromatic**, as non-aromatic sulfur molecules generally are not selectively adsorbed by the π -complexation dehydrated sorbents as recited in Applicants' claim 1.

Assuming *arguendo* that one skilled in the art would combine the suggested references, the combination would not render Applicants' invention as defined in claim 18, as none of the cited references teach the preferential adsorption of thiophene/thiophene compounds by π -complexation.

For all the reasons stated above, it is submitted that Applicants' invention as defined in claim 18 is not anticipated, taught or rendered obvious by Michlmayr, Milton, Tsybulevskiy, and Satokawa, either alone or in combination, and patentably defines over the art of record.

In summary, claims 1-20 remain in the application. It is submitted that through this communication, Applicants' invention as set forth in these claims is now in condition for suitable for allowance. Further and favorable consideration is requested.

UMJ-116-D (UM 2171p2)

11

If the Examiner believes it would expedite prosecution of the above-identified application, he is cordially invited to contact Applicants' Attorney at the below-listed telephone number.

Respectfully submitted,

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